Indiana Department of Environmental Management

2017 Sulfur Dioxide (SO_2)

Summary Report

Office of Air Quality
(800) 451-6027
www.in.gov/idem/airquality/2391.htm

About This Report

The Indiana Department of Environmental Management (IDEM) collects and analyzes air samples to monitor for regulated pollutants, including sulfur dioxide referred to as SO_2. Monitoring and reporting of SO_2 occurs on a year-round basis, as mandated by U.S. Environmental Protection Agency (U.S. EPA). This ***2017 Sulfur Dioxide (SO_2) Summary Report*** provides an overview of SO_2, including 2017 data and air quality trends over the past 10 years (2008-2017).

The following information is included in this report:

- General information about SO_2 *(slide 3)*
- Overview of SO_2 air health standards and requirements *(slides 4-6)*
- Overview of Indiana's SO_2 monitoring network *(slides 7-8)*
- Summary of 2017 SO_2 monitoring data *(slides 9-10)*
- SO_2 air quality trends over the last 10 years *(slides 11-13)*
- Status of SO_2 designations *(slides 14-16)*
- Links for additional information *(slide 17)*
- Contact information *(slide 18)*

What Is SO_2?

Sulfur dioxide (SO_2) is one of a group of highly reactive gases known as sulfur oxides (SO_x). Highly reactive gases are those that have a high potential to change in composition under certain conditions of pressure, temperature or light, or upon contact with another chemical. For example, SO_2 released into the atmosphere dissolves in water vapor to form acid rain.

Where does SO_2 come from?

SO_2 can come from natural sources, like volcanic activity, but also from the following man-made sources:

- Fossil fuel combustion at power plants and other industrial facilities.
- Industrial processes such as extracting metal from ore.
- Burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment.

What are the health effects of exposure to SO_2?

Breathing SO_2 has been linked to an array of adverse respiratory effects including:

- Narrowing of the airways leading to breathing difficulty (bronchoconstriction)
- Increased asthma symptoms, especially during exercise.
- Increased visits to emergency departments and hospital admissions for respiratory illnesses.

National Ambient Air Quality Standards (NAAQS) for SO_2

The federal Clean Air Act requires U.S. EPA to establish National Ambient Air Quality Standards (NAAQS) for certain pollutants, including sulfur dioxide (SO_2). NAAQS are also known as air health standards.

Primary annual and 24-hour and secondary annual and 3-hour NAAQS, established in 1971, set the first limits for SO_2. Since then, the NAAQS for SO_2 have been reviewed periodically and revised. In 1973, the secondary annual standard was revoked. In 2010, U.S. EPA revoked the annual and 24-hour primary SO_2 standards and established a 1-hour primary standard of 75 parts per billion (ppb). The secondary 3-hour SO_2 standard remains as originally set.

Primary Standards - Primary NAAQS set limits to protect public health, including the health of "sensitive" populations such as individuals with asthma, children and the elderly.

Secondary Standards - Secondary NAAQS set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

History of the SO_2 Standard

1971 — U.S. EPA first established a primary 24-hour standard of 0.14 parts per million (ppm) and an annual average standard at 0.03 ppm

1971 — U.S. EPA set a 3-hour average secondary standard at 0.50 ppm and set an annual standard at 0.02 ppm

1973 — U.S. EPA retained the existing 3-hour secondary standard and revoked the annual secondary SO_2 standard

1996 — After a scheduled review, U.S. EPA chose not to revise the SO_2 standards

2010 — U.S. EPA revoked the annual and 24-hour primary SO_2 standards and established a 1-hour standard of 75 ppb

2012 — U.S. EPA retained the existing secondary 3-hour SO_2 standard without revision.

Attaining the SO_2 Standard

Air quality monitoring data must measure at or below the 1-hour standard set by U.S. EPA for three complete, consecutive years to remain in attainment of the primary 1-hour SO_2 standard. For example, an evaluation in 2018 will be based on data from 2015 to 2017.

Primary 1-Hour SO_2 Standard – Air quality meets the 2010 primary 1-hour SO_2 standard when the 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years, does not exceed 75 parts per billion (ppb).

Design Values – The three-year average of the 99th percentile of 1-hour daily maximum concentrations is referred to as the Design Value.

The Difference Between an Exceedance and a Violation - When a monitor records a concentration above the limit established by the standard, it is referred to as an **exceedance**. A monitor can have an **exceedance** without being in **violation** of the standard. However, if a monitor's three-year **Design Value** exceeds the standard, the monitor is in **violation**.

2017 SO_2 Monitoring Network

Placement

- U.S. EPA provides guidance on placement of monitors.
- Monitor placement is based on population density and manufacturing levels.
- Indiana conducts an annual review of its ambient air monitoring network plan.

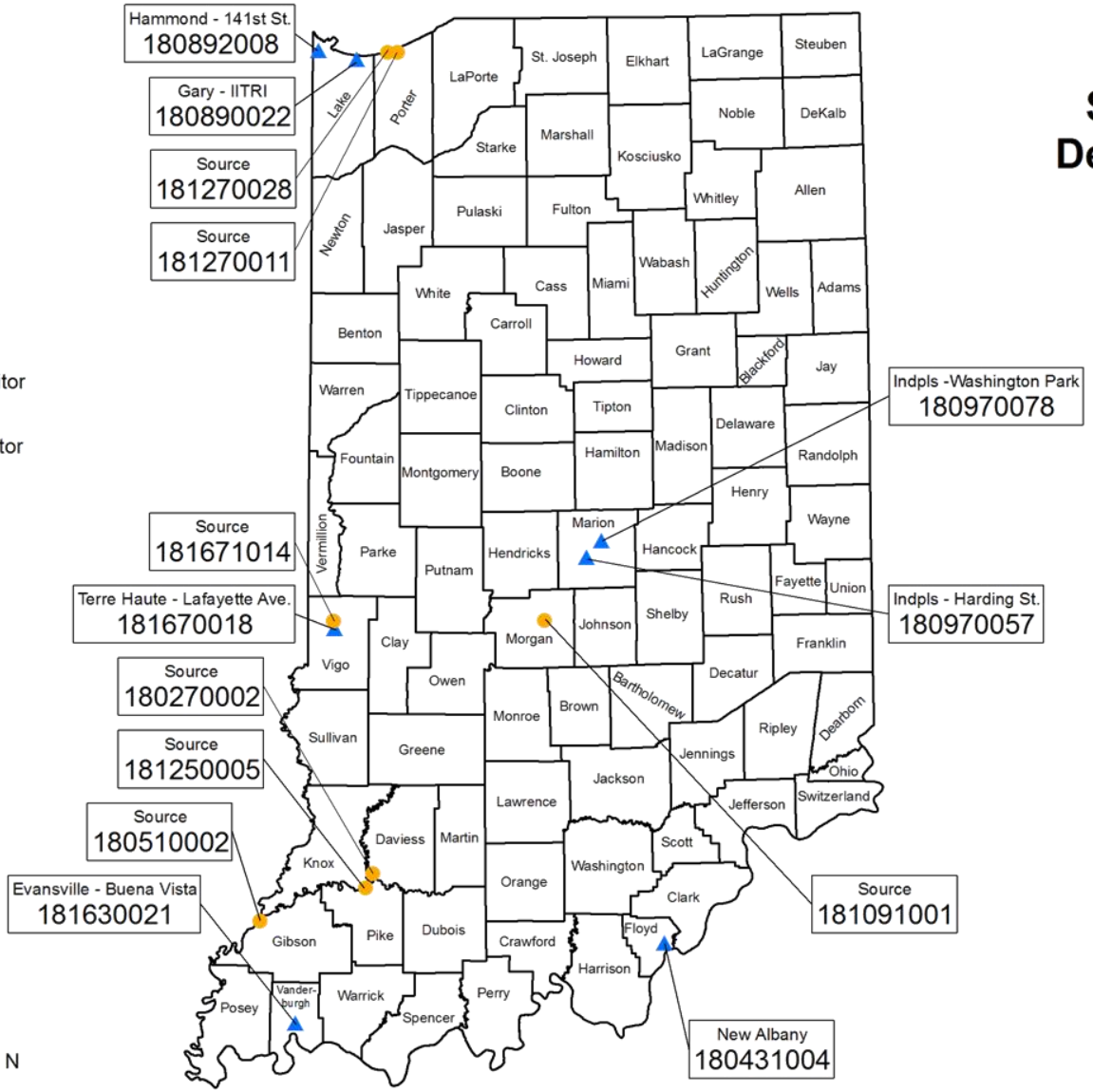
Monitors

- IDEM owned and operated 7 SO_2 monitors located in 5 counties across Indiana.
- There were 7 source-oriented SO_2 monitors collecting data in 6 counties in Indiana.

Calculating the Design Value

- A monitor's Design Value is calculated at the end of the year, once all of the data has been quality assured.
  - SO_2 Design Value: the 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

2017 SO_2 1-Hour Design Values Monitors



Legend

- Indiana Operated Monitor
- Source Operated Monitor

0 25 50 mi
0 25 50 km

Notes:
Numbers are site identification numbers used by U.S. EPA's Air Quality System Database.

Date: 04/20/2018
Mapped by: C. Mitchell, OAQ
Sources: Office of Air Quality
Map Projection: UTM Zone 16 N
Map Datum: NAD83

2017 SO_2 Monitoring Data Summary

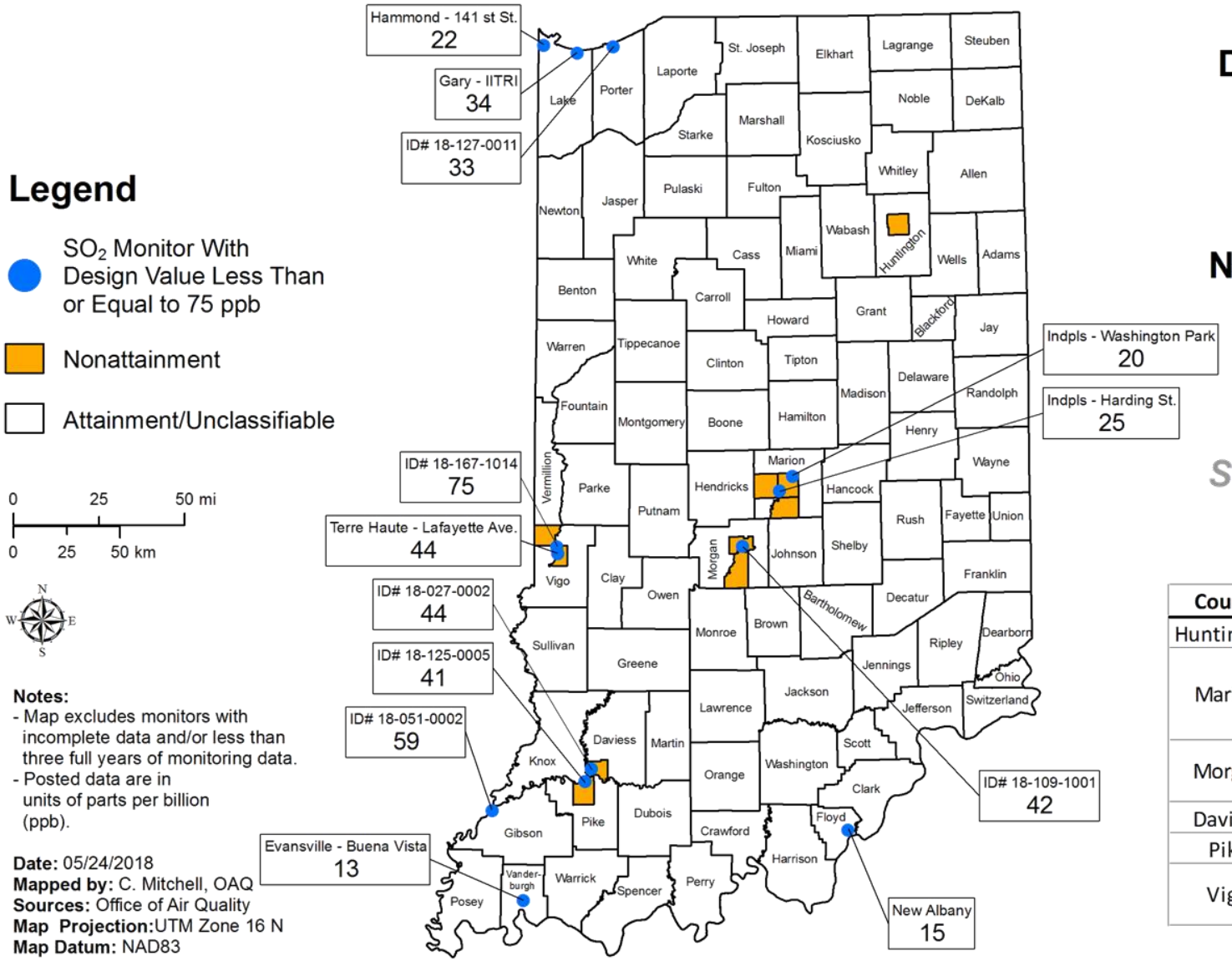
Quality assured monitoring data for 2017

- No IDEM-operated or source-oriented monitors had a 99th percentile of 1-hour daily maximum SO_2 concentration above the 2010 1-hour primary standard of 75 ppb.

Quality assured monitoring data for the 2015–2017 three-year timeframe

- No IDEM-operated or source-oriented monitors had an annual Design Value above 75 ppb.
- More monitoring information is found on slide 10.

SO_2 1-Hour Design Values 2015 - 2017 and SO_2 Nonattainment Areas



Standard Set at 75 ppb

County	Nonattainment
Huntington	Huntington Township
Marion	Center Township
	Perry Township
	Wayne Township
Morgan	Clay Township
	Washington Township
Daviess	Veale Township
Pike	Washington Township
Vigo	Fayette Township
	Harrison Township

Notes:
- Map excludes monitors with incomplete data and/or less than three full years of monitoring data.
- Posted data are in units of parts per billion (ppb).

Date: 05/24/2018
Mapped by: C. Mitchell, OAQ
Sources: Office of Air Quality
Map Projection: UTM Zone 16 N
Map Datum: NAD83

SO_2 Air Quality Trends

Monitoring data shows significant improvements in Indiana's air quality over the past 10 years. The following two slides provide illustrations.

SO_2 Air Quality Trends – 1-Hour NAAQS
Annual 99th Percentile Values (2007-2017)

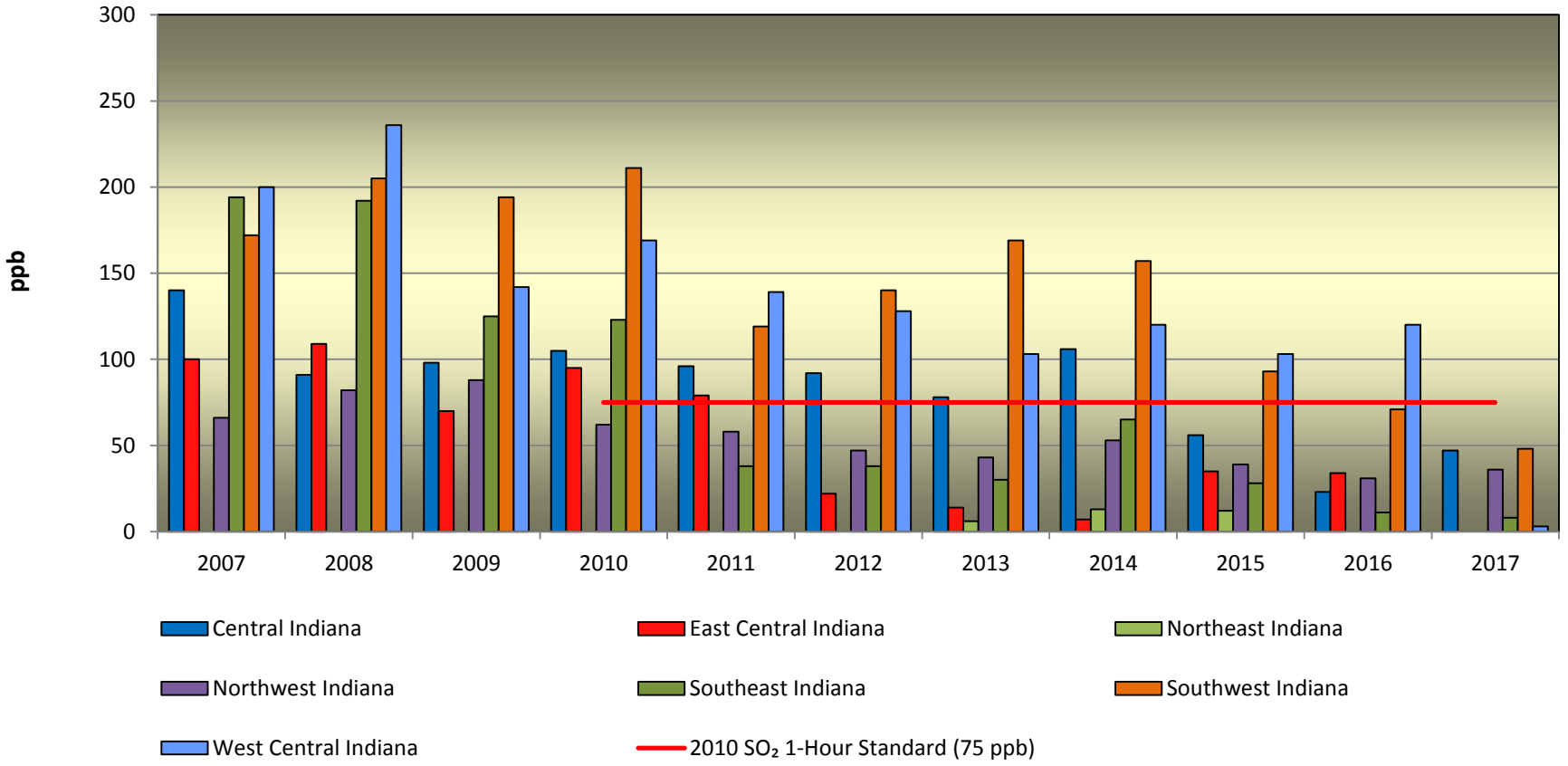


Chart excludes monitors with incomplete data and/or less than three full years of monitoring data.
ppb = parts per billion

SO_2 Air Quality Trends – 1-Hour NAAQS
Three-Year Design Values (2007-2017)

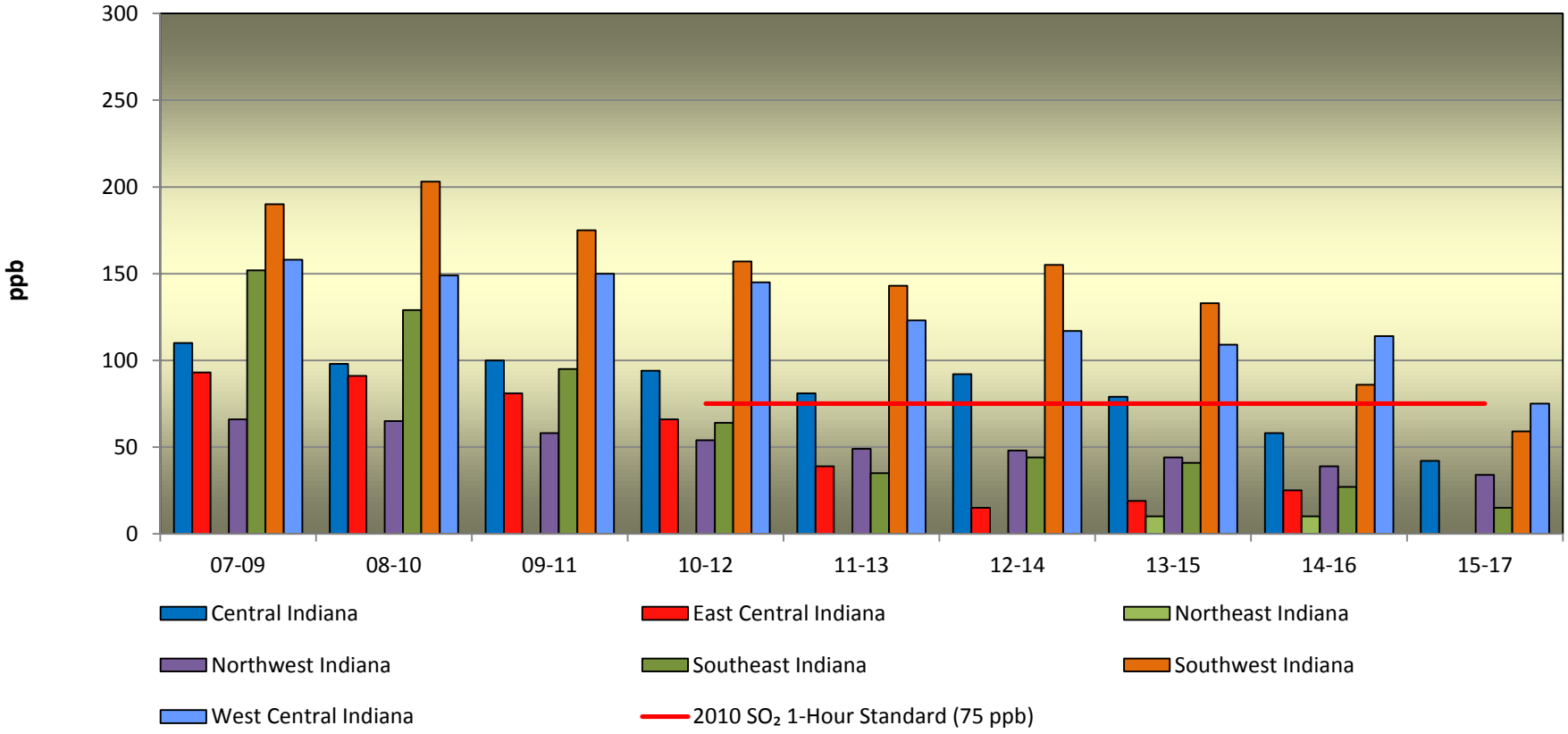
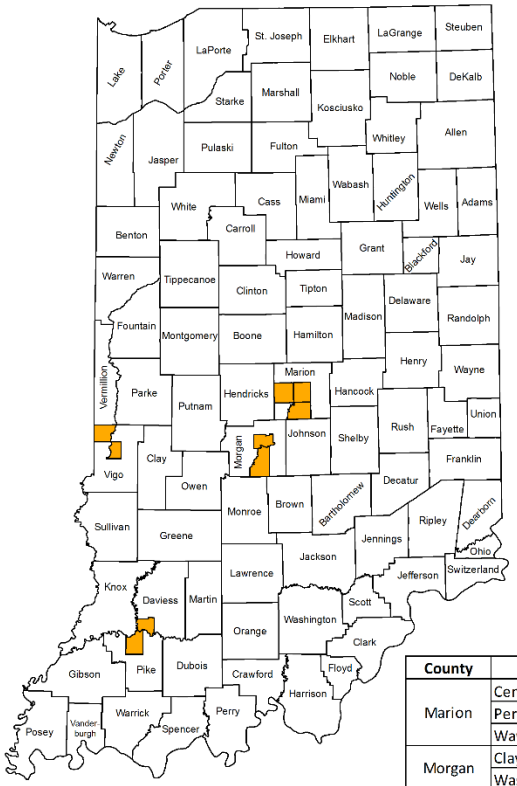


Chart excludes monitors with incomplete data and/or less than three full years of monitoring data.
ppb = parts per billion

Sulfur Dioxide - Round 1 Area Designations

- On July 25, 2013, U.S. EPA designated four nonattainment areas, comprised of nine townships in five counties, under the 2010 primary 1-hour SO_2 standard. Designations were effective October 4, 2013.
- On October 2, 2015, Indiana submitted an attainment demonstration to U.S. EPA for review and approval.
- By October 4, 2018, areas designated nonattainment must attain the standard.
- On July 10, 2017, Indiana, based on 2014 – 2016 monitoring data, submitted a redesignation petition and maintenance plan to U.S. EPA for the Indianapolis, IN (Marion County) nonattainment area.
- Indiana, based on 2015 – 2017 monitoring data, is drafting redesignation petition and maintenance plans for the Morgan County and Southwest Indiana nonattainment areas.

Round 1 SO_2 Nonattainment Areas

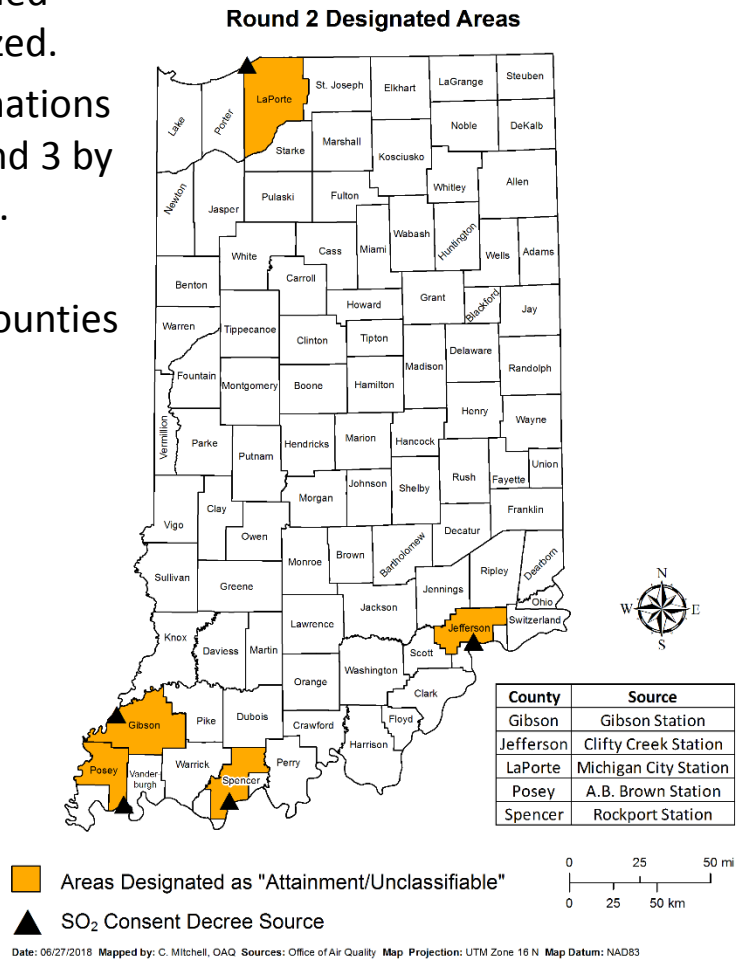


County	Nonattainment
Marion	Center Township
	Perry Township
	Wayne Township
Morgan	Clay Township
	Washington Township
Daviess	Veale Township
Pike	Washington Township
Vigo	Fayette Township
	Harrison Township

Sulfur Dioxide - Round 2 Area Designations

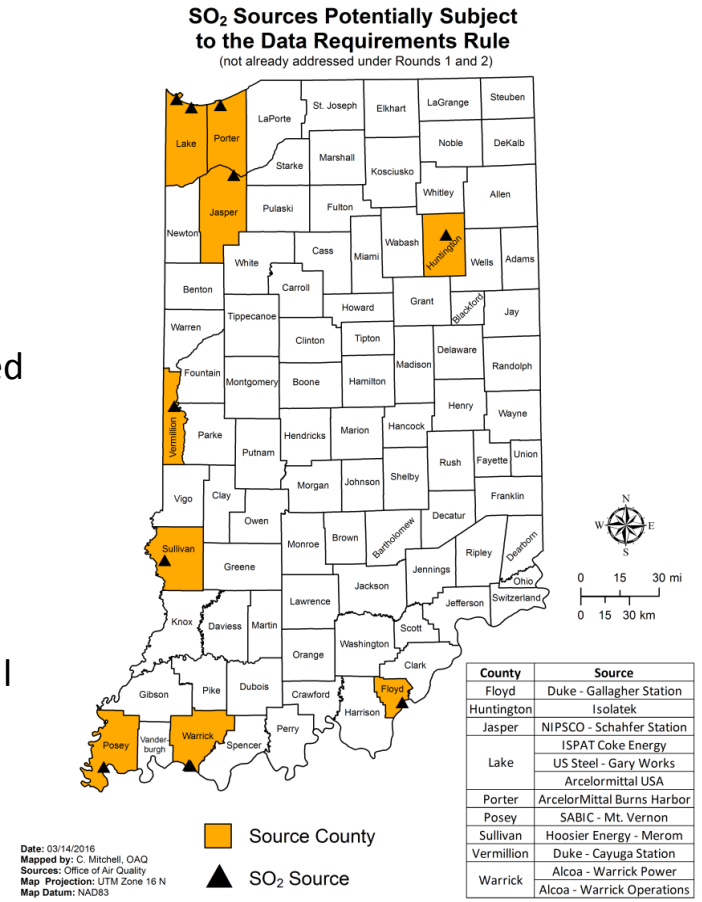
- Due to a March 2, 2015 Consent Decree, U.S. EPA identified additional sources around which SO_2 must be characterized.
- The court order directed U.S. EPA to complete the designations in three additional rounds: Round 2 by July 2, 2016, Round 3 by December 31, 2017, and Round 4 by December 31, 2020.
- On June 30, 2016, U.S. EPA designated Gibson, Jefferson (partial), LaPorte, Posey (partial), and Spencer (partial) counties in Indiana "attainment/unclassifiable".

County	Area	
Gibson	Full County	
Jefferson	Partial County	Graham, Lancaster, Madison, Monroe, Republican, Shelby and Smyrna Townships
LaPorte	Full County	
Posey	Partial County	Bethel, Center, Harmony, Lynn, Marrs, Robb, Robinson and Smith Townships
Spencer	Partial County	That portion of Ohio township north of UTM 4187.580 km northing, and Carter, Clay, Grass, Hammond, Harrison and Jackson Townships



Sulfur Dioxide - Round 3 and 4 Area Designations

- On August 10, 2015, U.S. EPA finalized the Data Requirements Rule (DRR), which required states to characterize air quality around additional sources of SO_2.
- On December 21, 2017, U.S. EPA designated Floyd, Jasper, Lake, Posey, Sullivan, Vermillion, and Warrick counties "attainment/unclassifiable" and Huntington County (Huntington Township) as "nonattainment". Remaining areas of the State except for Porter County were designated as "attainment/unclassifiable".
- On March 9, 2018, IDEM submitted a petition to U.S. EPA requesting reconsideration of its decision to designate Huntington Township as "nonattainment" under the standard and reclassify the township as "unclassifiable".
- Porter County is an area for which Indiana elected to install and operate an SO_2 monitoring network. Pursuant to the court ordered schedule, U.S. EPA is required to designate this area by December 31, 2020.



County	Source
Floyd	Duke - Gallagher Station
Huntington	Isolatek
Jasper	NIPSCO - Schahfer Station
Lake	ISPAT Coke Energy
	US Steel - Gary Works
	Arcelormittal USA
Porter	ArcelorMittal Burns Harbor
Posey	SABIC - Mt. Vernon
Sullivan	Hoosier Energy - Merom
Vermillion	Duke - Cayuga Station
Warrick	Alcoa - Warrick Power
	Alcoa - Warrick Operations

Additional Information

- For additional SO_2 monitoring information, visit IDEM's website: www.IN.gov/idem/airquality/2346.htm
- For additional information regarding the designation process or Indiana's redesignation petitions and maintenance plans, visit www.IN.gov/idem/airquality/2342.htm
- For additional information regarding the NAAQS for sulfur dioxide, visit U.S. EPA's Sulfur Dioxide (SO_2) Primary Air Quality Standards website: https://www.epa.gov/naaqs/sulfur-dioxide-so2-primary-air-quality-standards

Contact

Please feel free to direct questions or comments to Ms. Catherine Mitchell with IDEM's Office of Air Quality at (800) 451-6027 (*toll free*), (317) 234-6530 (*direct*), or cmitchel@idem.IN.gov.